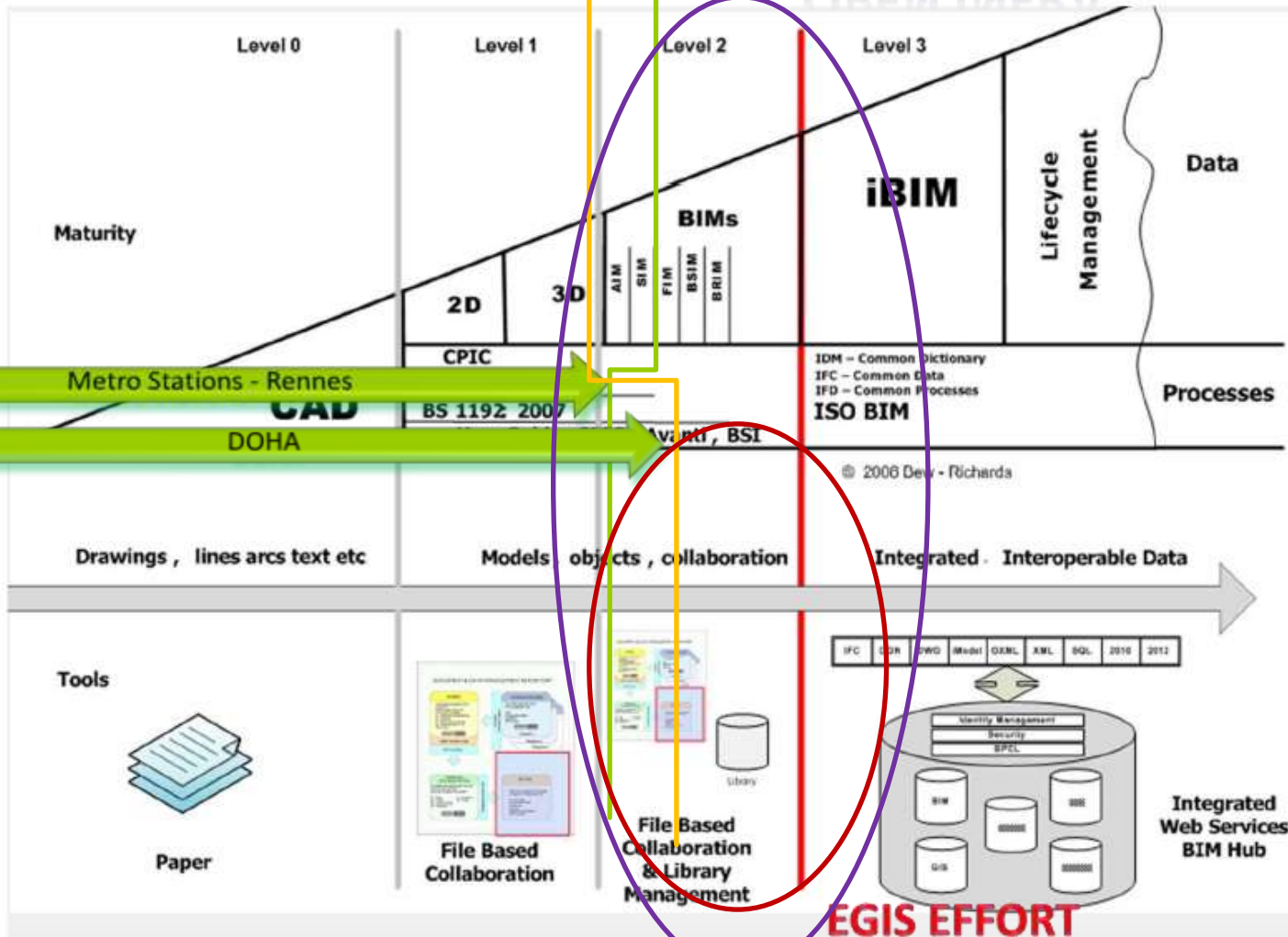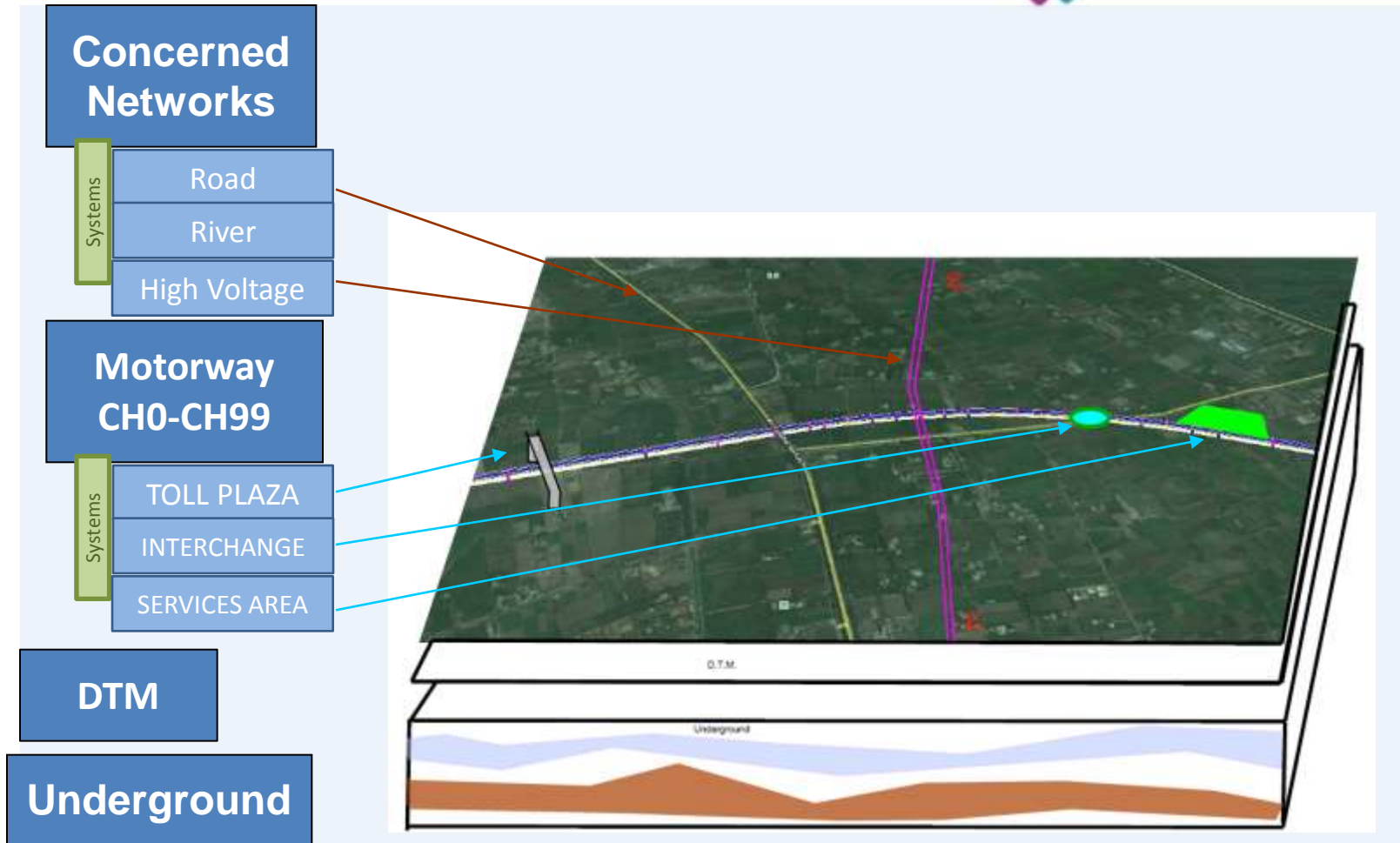**La Nouvelle Route du Littoral**
**Metro stations Rennes**
**DOHA Express Way**
**Qatar Rail**
**L2 in Marseille**
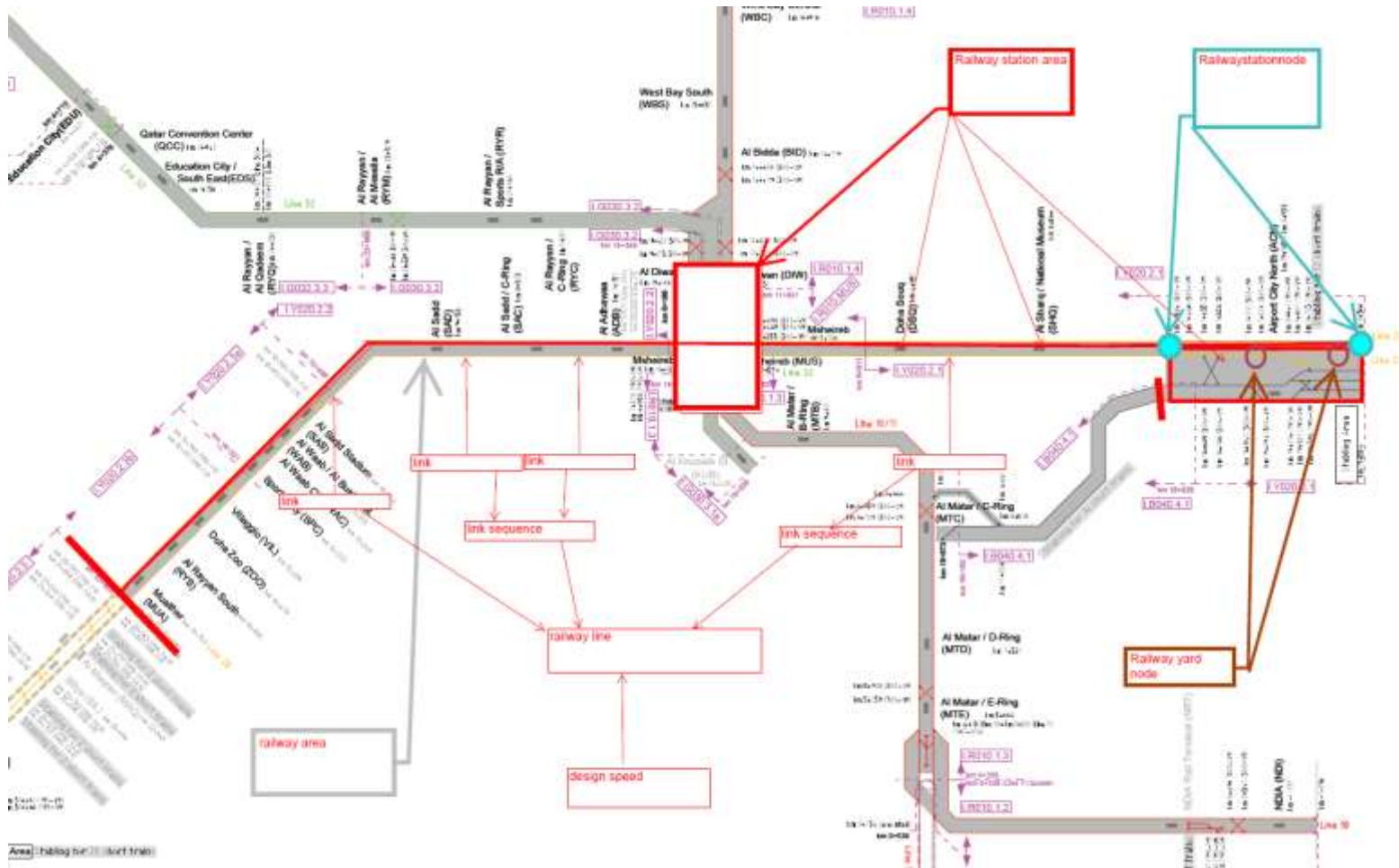**FFR stadium**
**EOLE express train**

- Around **€15 billions** of works in progress

- Potential of IFC exchange based on existing:
    - NRL : 0%
    - L2 Marseille : 2%
    - Metro Station Rennes : 60%
    - Stade FFR : 60 %
    - Qatar Rail : 20 %

- But BIM is not only IFC

# Motorway description



**Concerned Networks**

Systems
- Road
- River
- High Voltage

**Motorway CH0-CH99**

Systems
- TOLL PLAZA
- INTERCHANGE
- SERVICES AREA

**DTM**

**Underground**
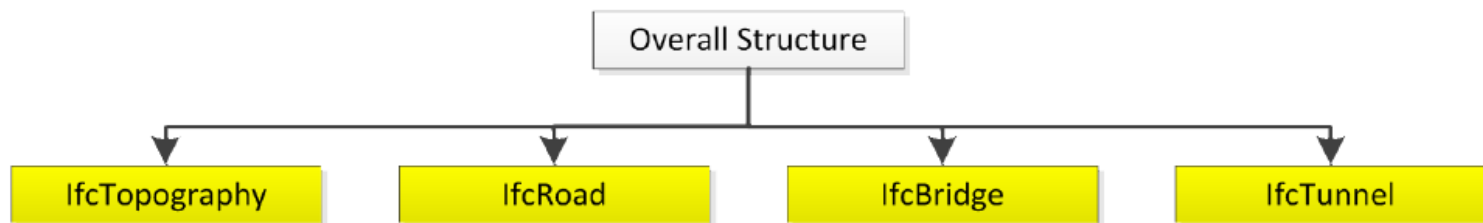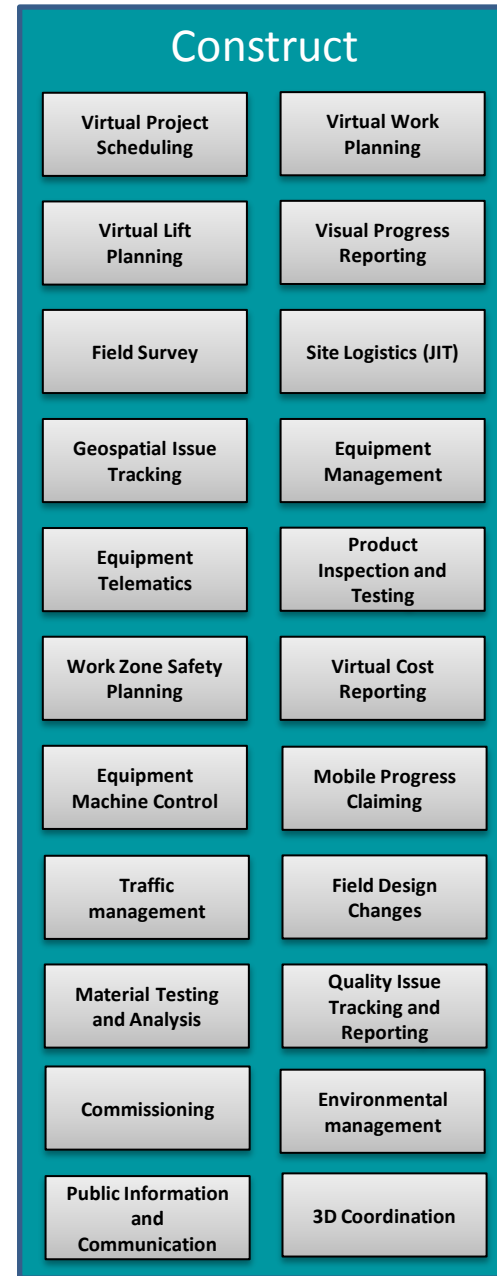
# QATAR Rail description
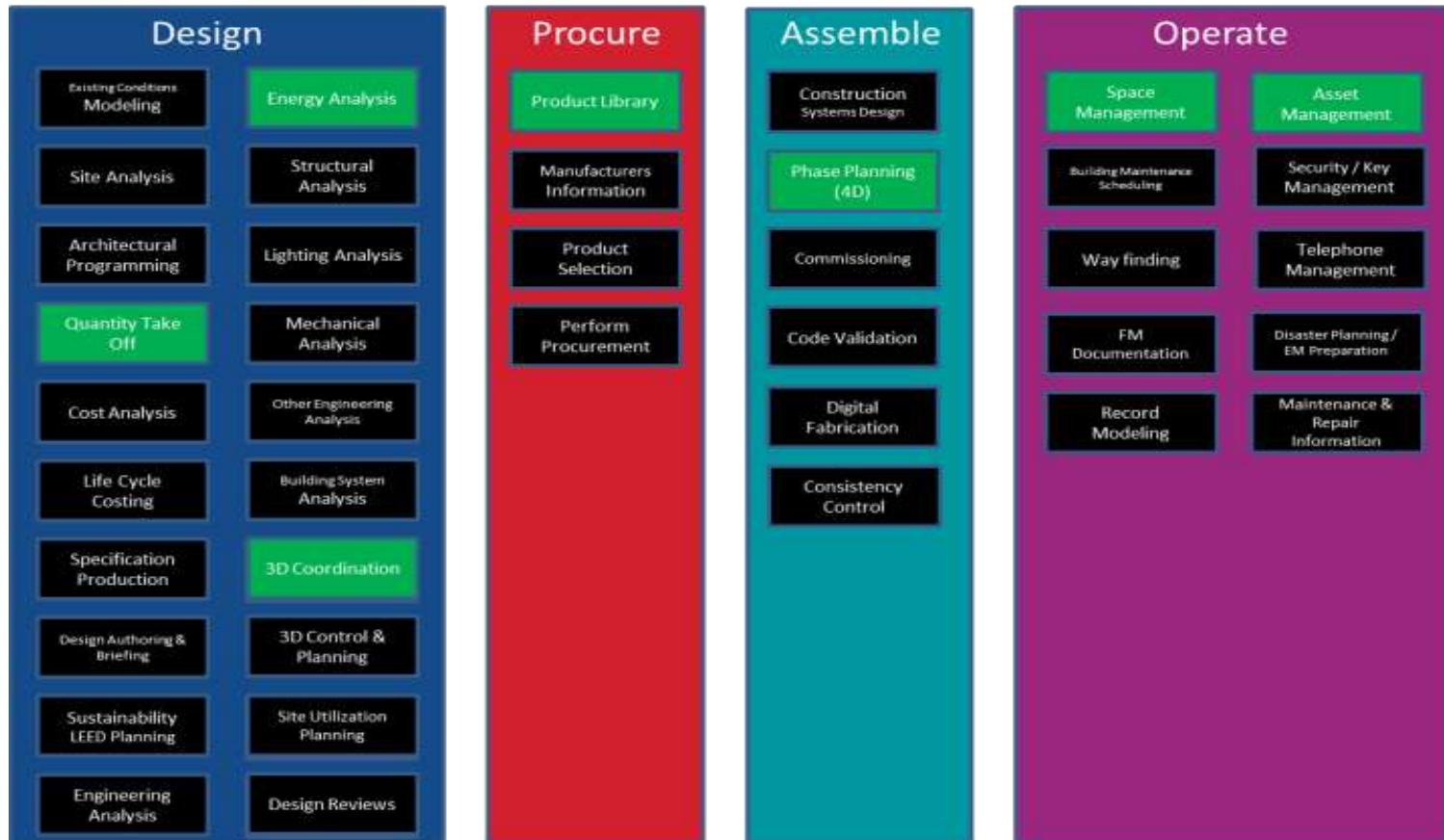
# Proposed Overall IFC structure of highway project



Hyunjoo Kim PhD

# Infrastructure engineering

## Design

| | |
|---|---|
| Land Use and Transportation Planning | Land acquisition |
| Public Information and Communication | Hydrology |
| Traffic Impact Simulations | Traffic management |
| Engineering Analysis | Archeology |
| Target Quantity Tracking | Geotechnical |
| Constructability Reviews | Environmental assessment |
| 3D Coordination | Sustainability LEED Planning |
| Rule-based Model Validation | Quantity Take-Off |
| earthwork | Pavement |
| ITS | tolling |

## Procure

- Product Master Data
- Enterprise Buying
- Product Inventory Management
- Product Vendor Management
- Supply Chain Management
- Business to Business Transactions
- Material Tagging and Tracking
- Automated Procurement

## Construct

| | |
|---|---|
| Virtual Project Scheduling | Virtual Work Planning |
| Virtual Lift Planning | Visual Progress Reporting |
| Field Survey | Site Logistics (JIT) |
| Geospatial Issue Tracking | Equipment Management |
| Equipment Telematics | Product Inspection and Testing |
| Work Zone Safety Planning | Virtual Cost Reporting |
| Equipment Machine Control | Mobile Progress Claiming |
| Traffic management | Field Design Changes |
| Material Testing and Analysis | Quality Issue Tracking and Reporting |
| Commissioning | Environmental management |
| Public Information and Communication | 3D Coordination |

## Operate

- Road /rail Management
- Maintenance & Repair
- Transportation Management Systems
- Traffic Volume Simulations
- Event Planning
- GIS Asset Tracking
- Toll and Facility Management
- Emergency Response and Repair
- Water Mitigation and Planning
- Disaster Planning
- Public Information and Communication

# Design

| | |
|---|---|
| Existing Conditions Modeling | Energy Analysis |
| Site Analysis | Structural Analysis |
| Architectural Programming | Lighting Analysis |
| Quantity Take Off | Mechanical Analysis |
| Cost Analysis | Other Engineering Analysis |
| Life Cycle Costing | Building System Analysis |
| Specification Production | 3D Coordination |
| Design Authoring & Briefing | 3D Control & Planning |
| Sustainability LEED Planning | Site Utilization Planning |
| Engineering Analysis | Design Reviews |

# Procure

- Product Library
- Manufacturers Information
- Product Selection
- Perform Procurement

# Assemble

- Construction Systems Design
- Phase Planning (4D)
- Commissioning
- Code Validation
- Digital Fabrication
- Consistency Control

# Operate

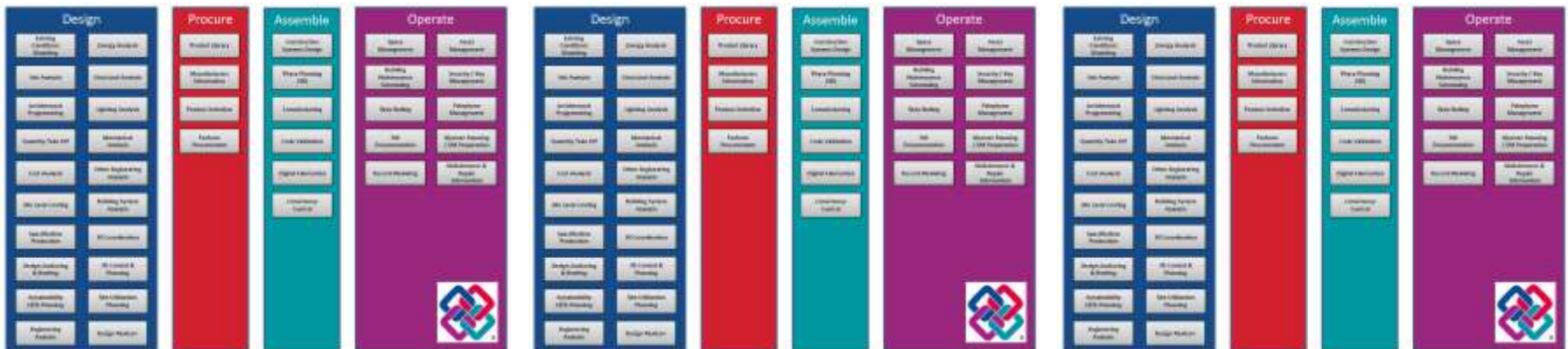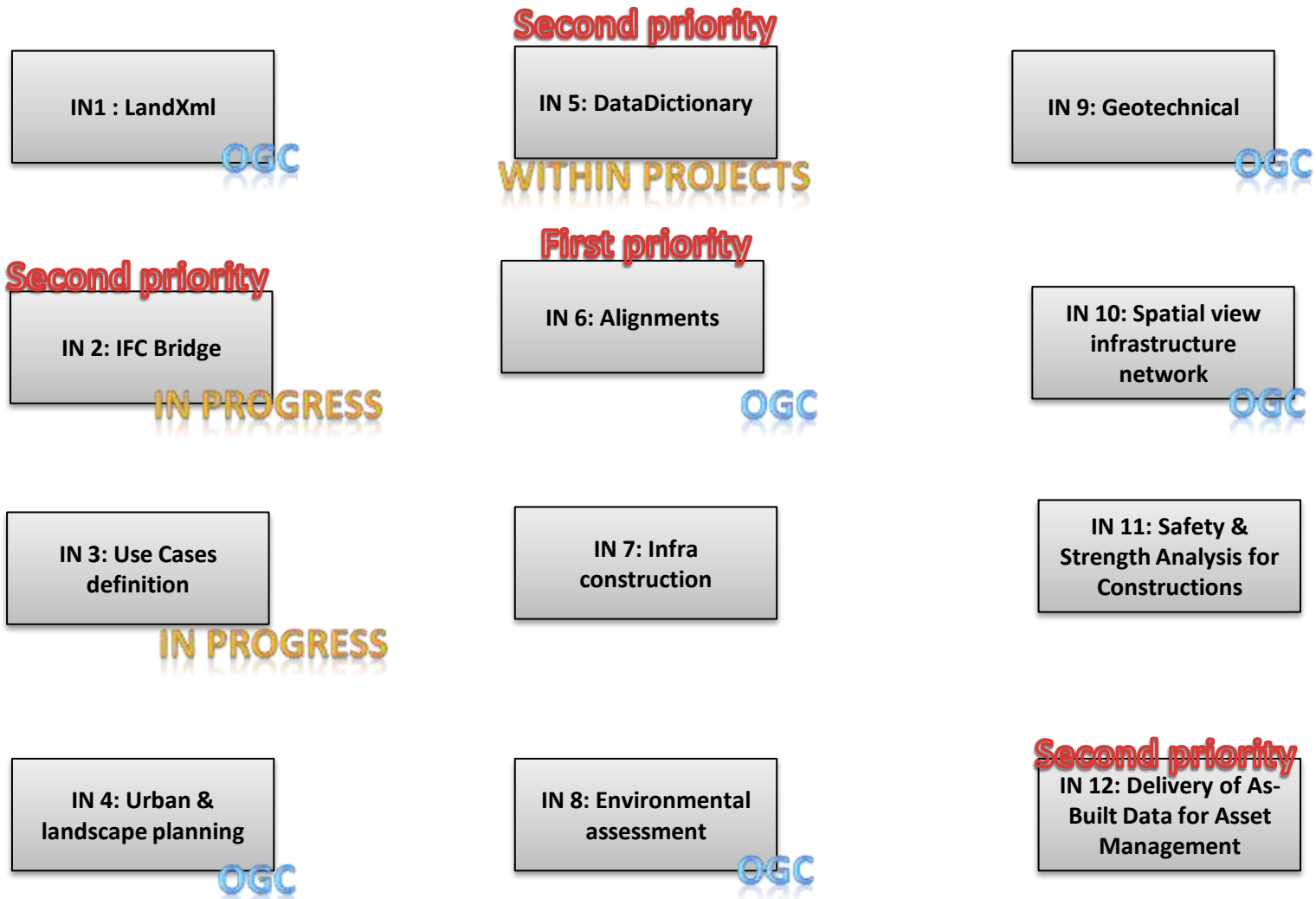| | |
|---|---|
| Space Management | Asset Management |
| Building Maintenance Scheduling | Security / Key Management |
| Way finding | Telephone Management |
| FM Documentation | Disaster Planning / EM Preparation |
| Record Modeling | Maintenance & Repair Information |

Road/ railway/Building/bridge/tunnel/ engineering

Infrastructure engineering
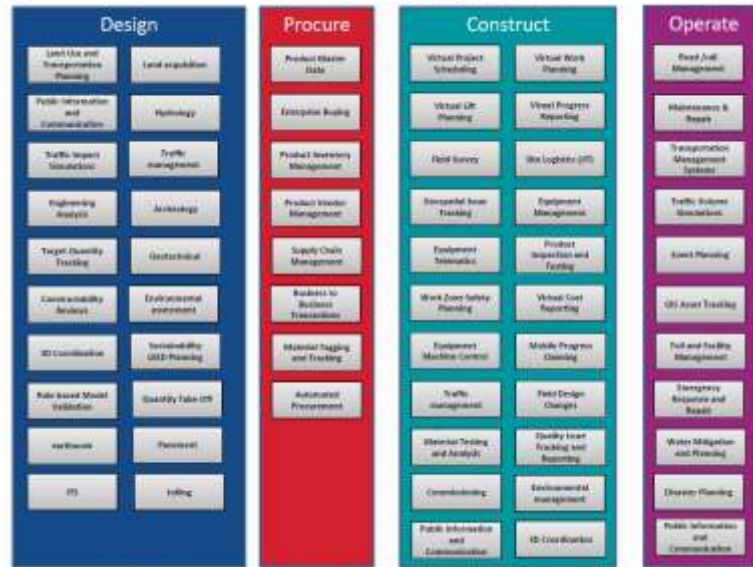
# Road Map 2016 : Projects to go forward

openINFRA

IN1 : LandXml
OGC

Second priority

IN 5: DataDictionary

WITHIN PROJECTS

IN 9: Geotechnical
OGC

Second priority

IN 2: IFC Bridge

IN PROGRESS

First priority

IN 6: Alignments
OGC

IN 10: Spatial view infrastructure network
OGC

IN 3: Use Cases definition

IN PROGRESS

IN 7: Infra construction

IN 11: Safety & Strength Analysis for Constructions

IN 4: Urban & landscape planning
OGC

IN 8: Environmental assessment
OGC

Second priority
IN 12: Delivery of As-Built Data for Asset Management

**Chair:**

o        Christophe Castaing

**Vice chair:**

Henk Schaap

**Coordinator:**

o        Henk Schaap

**InfraCom**

| | |
|---|---|
| Pierre Benning | Henk Schaap |
| Christophe Castaing | Jim Plume |
| Hyunjoo Kim (secretary) | |

-

**Steering Committee:**

| | |
|---|---|
| Pierre Benning | Vaino Tarandi |
| Stuart Chen | Hugh Woods |
| Wonsik Choi | Nobuyoshi YABUKI |
| Hyunjoo Kim | Jim Plume |
| Paul Scarponcini | Benno Koehorst |
| Mikael Malmkvist | Johnny Jensen |
| Andre Borrmann | |

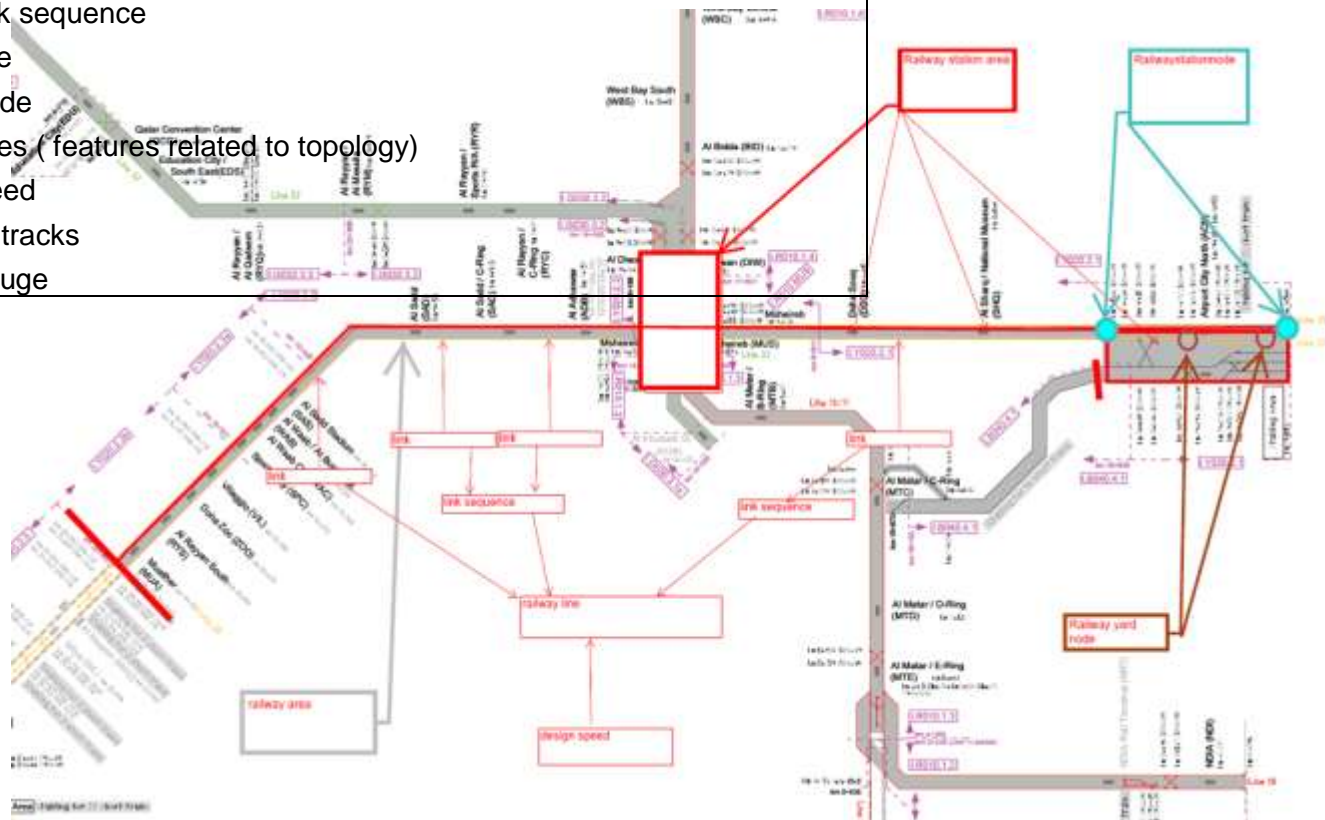| Infra Room 13/10-2 | The Infra Room resolves to work on an overall strategy that gives direction for future work of the Infra room. It is expected to be discussed in the next Infraroom meeting (March 2014). The Steering Committee is asked to take action on this. |
|---|---|
| | |
| Infra Room 13/10-3 | The Infra Room welcomes the proposal from Rijkswaterstaat to position COINS as an affiliated standard for buildingSMART and to bring this on the agenda of ITM |
| | |
| Infra Room 13/10-4 | The Infra Room welcomes the initiative to forward a New Work Item to bring the Dutch COINS standard in a ISO standard and include PLCS developments. Encourage other chapters/countries to join this initiative |
| | |
| Infra Room 13/10-5 | The Infra Room Resolves to express the need for extending the IFD standard to the level of interoperability and ask the product room to take action on this. |
| | |
| Infra Room 13/10-6 | The Infra Room welcomes the MOU between buildingSMART, Rijkswaterstaat, V-Con and Trafikverket to work together to complete the Project IFC Alignment model. |
| | |
| Infra Room 13/10-7 | The Infra Room resolves to give top priority to the Alignment project as expressed in the project summary of IFC Alignment and decides that alignment is needed in the next version of IFC. The first task of Infracom is to prepare a project management plan. |
| | |
| Infra Room 13/10-8 | The Infra Room Concludes that coordination and collaboration with OGC and landXML is a crucial issue for the alignment project. |
| | |
| Infra Room 13/10-9 | The Infra Room resolves that the other top priorities are: Data dictionary, IFC-bridge and Delivery of As-built data. Volunteers to work in activities on this priorities are identified. The steering committee will plan next steps. The development of use cases will be part of the activities. |
| | |
| Infra Room 13/10-10 | The Infra Room welcomes the Korean IFC Road proposal to collaborate with the buildingSMART Infra room on the alignment project. Therefore Infrastructure room thankfully acknowledge the IFC Road proposal by KICT of Korean chapter and will recommend to Excom and ITM that it would be accepted after any necessary clarification. |
| | |
| Infra Room 13/10-11 | The Infra Room recommends making the current LandXML MVD draft publically available for review and commenting via the buildingSMART website and encourages Infracom to organize a meeting with implementers |
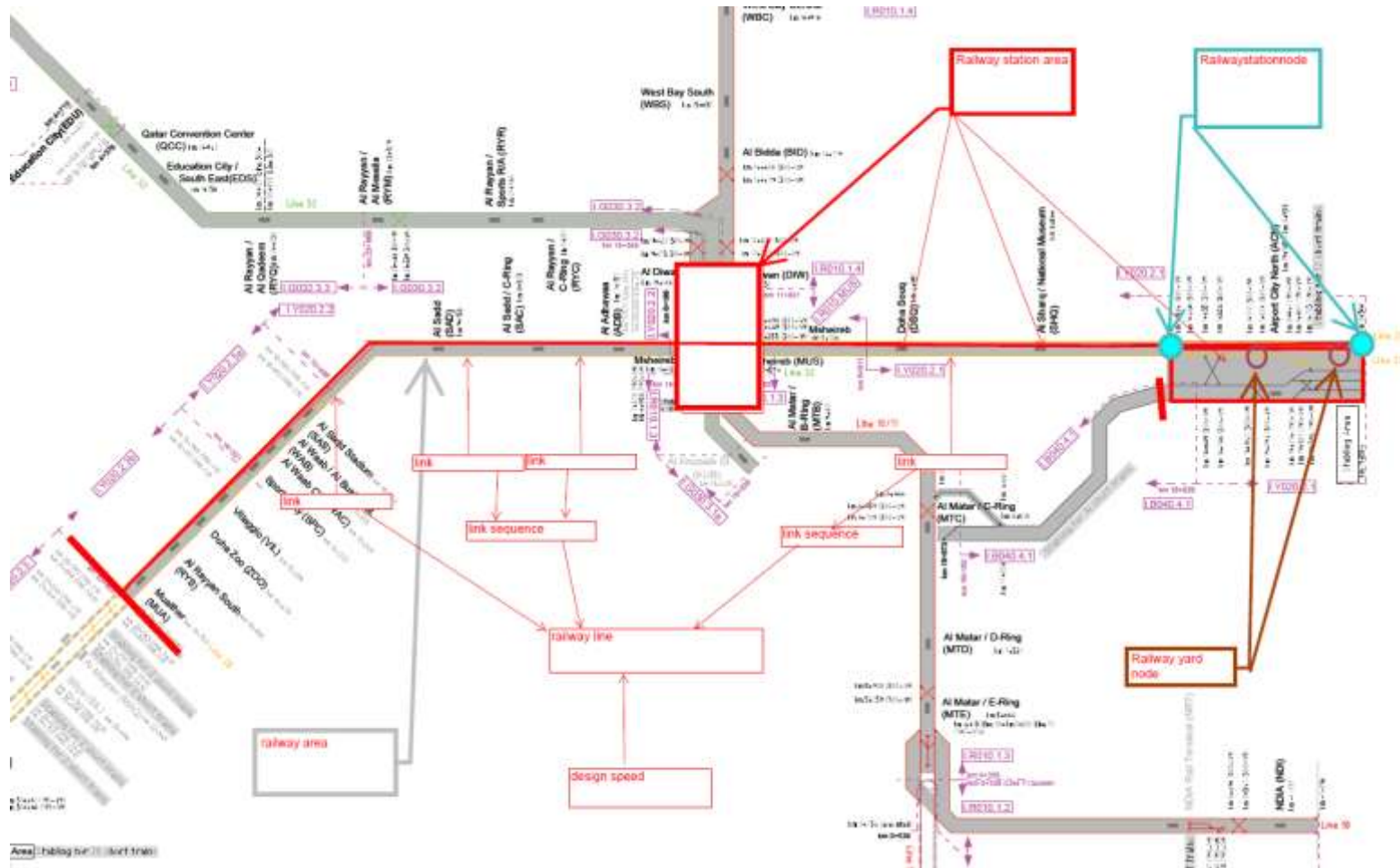
1.1.1      The Engineer's BIM Manager:

    a)    Defines the Program BIM requirement;

    b)    Ensures the BIM process serves the engineering and business requirement during the design and build phase of the Works;

    c)    Ensures that data schema declared for the program serves the engineering requirements of the design and build phase of the Works;

    d)    Ensures industry best practice is utilised for the BIM implementation and to facilitate the transition of design and as built data into operational data and information for Qatar Rail.

1.1.2      The Engineer's BIM Coordinator:

    a)    Ensures the BIM process as declared by the Contractor is being effectively implemented and utilised by the Contractor;

    b)    Verifies each BIM plan submitted by the Contractor meets the engineering requirement for the specific piece for work;

    c)    Ensures the BIM process is delivering the engineering benefit declared by the Contractor for that stage in the design and build program.
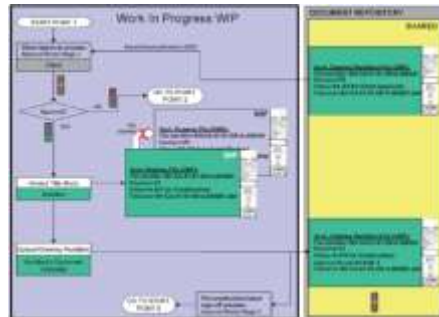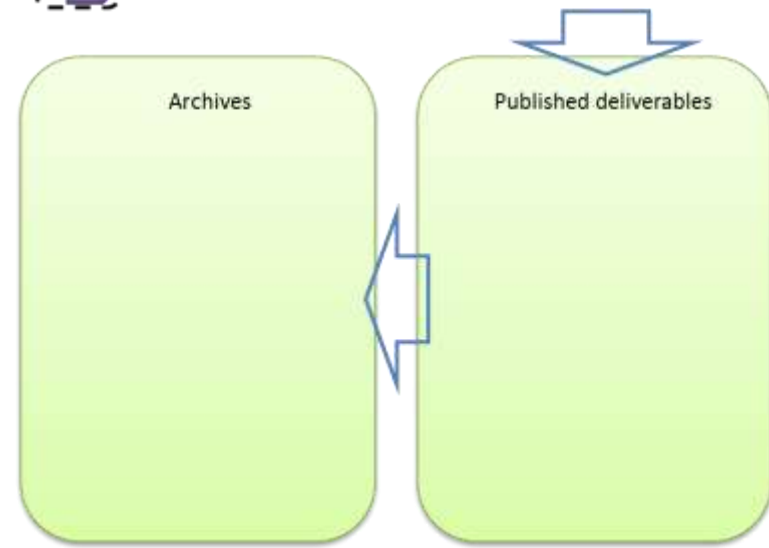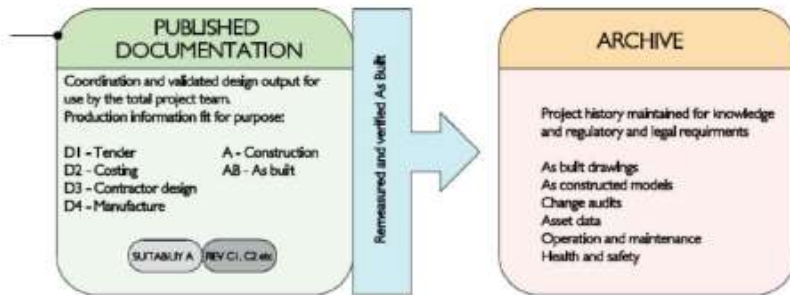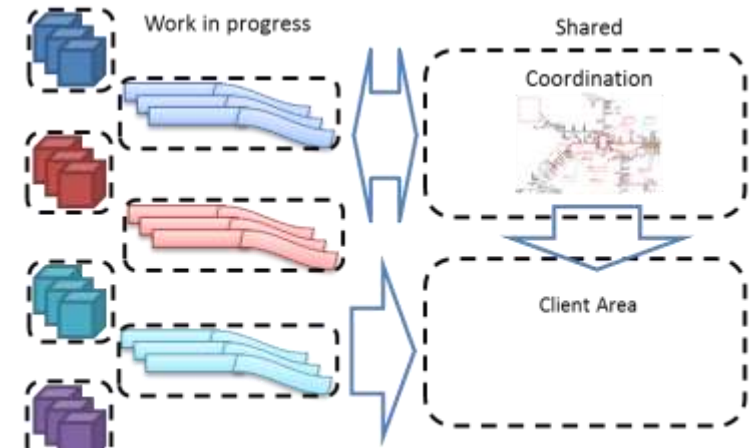
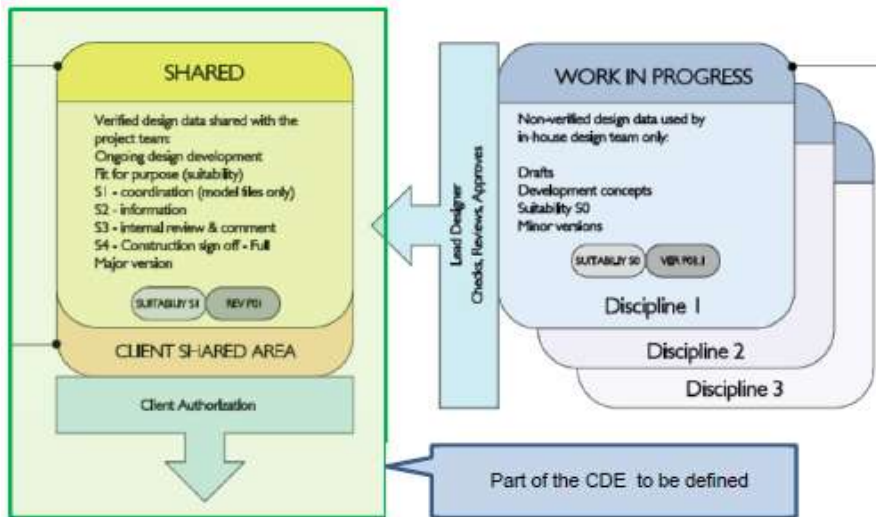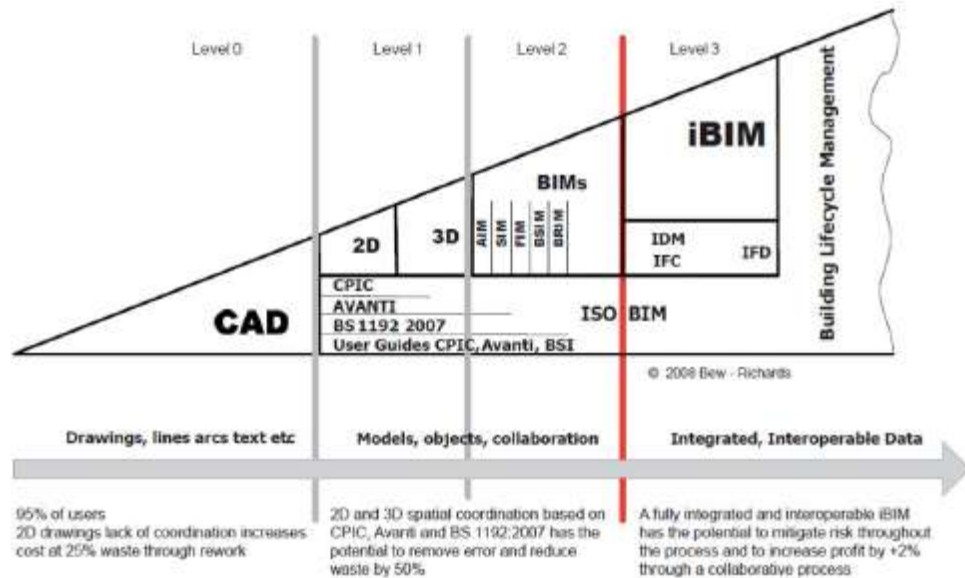**Three classes**

- Spatial area objects ( topographic area) – Zone ?
    - Railway station area
    - Railway area
    - Railway yard area
- Spatial objects ( topological)
    - Railway link
    - Railway link sequence
    - Railway line
    - Railway node
- Spatial objects features ( features related to topology)
    - Design speed
    - Number of tracks
    - Railway gauge

| domain N1 | Owner | stakeholder | DATA FEATURES AND SOFTWARE | | | | WORKS TO BE MANAGED | | | ACTION UNDER MODEL |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | SOFTWARE | data | BIM level | geo spatial | detailled design objects N2 | N3 | interface | Analysis/Request in 3D |
| Line ( N0) | | | | | | yes (reference) chainage | | | others line | |
| Tunnel | | | | 3D ponctuel 3D surfaciques | level 1 | | Tube n°1 Tube n°2 | tube geometry ( centerline/VA, CS) Track geometry Structure Tunnel Ventilation Gabarit dynamique Internal diameter External diameter Right of Way Influence Zone Protection Zone Drainage System 1st layer Concrete | Utilities (Kahramaa, Qtel, …) Ashghal Road Program Existing Building (Car park, foundation) IDRIS program Futur surounding Development System Contractor Safety Autorities | Synthesis clash analysis box connection geotechn analysis clearance analysis |
| BOX ( station) | | | | 3D as surfaces | level 1 | | to developp from Rennes model | Track geometry Gabarit dynamique structure stair case Room / level Maintenance Access Colon Layout Cable route / Raiser | ground level equipement box tunnel segment electrical&mechanical&telecom equipement safety equipement Utilities (Kahramaa, Qtel, …) Ashghal Road Program Futur surounding Development Existing Building (Car park, foundation) IDRIS program Safety Autorities Civil Contractor System Contractor | Synthesis clash analysis box connection geotechn analysis clearance analysis |
| Switch Box | | | | 3D as surfaces | level 1 | | to developp from Rennes model | Track geometry Structure Tunnel Ventilation Gabarit dynamique Internal diameter External diameter Cable route / Raiser | ground level equipement box tunnel segment electrical&mechanical&telecom equipement safety equipement Utilities (Kahramaa, Qtel, …) Ashghal Road Program Futur surounding Development Existing Building (Car park, foundation) System Contractor Safety Autorities | Synthesis clash analysis box connection geotechn analysis clearance analysis |
| Emergency Exit | | | | 3D as surfaces | level 1 | | to developp from Rennes model | Track geometry Gabarit dynamique structure stair case Room / level Maintenance Access Cable route / Raiser | ground level equipement box tunnel segment electrical&mechanical&telecom equipement safety equipement Utilities (Kahramaa, Qtel, …) Ashghal Road Program Futur surounding Development Existing Building (Car park, foundation) Safety Autorities System Contractor | Synthesis |
| TERRAIN MODEL | | | LANDXML | 3D as surfaces | | | global modeling | | breaklines | |
| GEO TECH | not in the scope | | | | | ? | layers displaying water table | | structure basement road basement | Analyse de gabarit/réserve vs couches. Identification purges éventuelles. |
| Cross Passage | | | | 3D as surfaces | level 1 | | to developp from Rennes model | Track geometry Gabarit dynamique structure stair case Room / level Maintenance Access Cable route | ground level equipement box tunnel segment electrical&mechanical&telecom equipement safety equipement Utilities (Kahramaa, Qtel, …) Ashghal Road Program Futur surounding Development Existing Building (Car park, foundation) Safety Autorities System Contractor Civil Contractor | Synthesis clash analysis box connection geotechn analysis clearance analysis |
| Ground level Equipement | | | | 3D objects | | | to be defined trees Options | | interchange interface | Presentation intentions paysagères appliquées aux diffuseurs. Mise en évidence situations ultérieure due croissance des végétaux. |
| Architechture | | | | | | | | | System Contractor Civil Structure MEP Safety | |
| lighting | | | | | | 2d objects ? | drawpit ducting/trench cabinet poles | | Architecture branding Civil Work System Contractor Safety | |
| Hvac ( civil works) | | | | | | 2d objects ? | drawpit ducting/trench cabinet poles | | System contractor Station ventillation Structure interfaces (Space & shaft) Structure interfaces safety equipement | |
| Electrical & Mechanical | | | | | | 2d objects ? | drawpit ducting/trench cabinet poles | | System Contractor Architecture Civil structure (Cable route) Structure interfaces safety equipement | |
| UTILITIES | | | | | | ? | connection to existing ( water, power, telecom) | | | |

Level 3 cannot be obtained in any case :

*Fully open process and data integration managed by a collaborative model server and could be regarded as iBIM or integrated BIM, potentially employing concurrent engineering processes.*

IDM/IFC is partially possible on some objects or works, like Station, in using Revit. No possibility with others tools used for the linear elements.
Concurrent engineering processes are only partially possible.

A full level 1 can be obtained for the part of the project related to the link ( linear elements) including objects and collaborative tools (CDE)

A partial Level 2 can be obtained for the part of the project related to the stations

The scope is:

- Common Data environment (CDE)  to be defined
- BIM scope to be defined:
    - Processes covered by BIM (anticipated Bim scope)
    - BIM software involved in the processes
    - Relevant BIM levels
- Works Breakdown structure
    - Uniclass objects hierarchy
    - Digital data protocol ( data dictionary and data delivery)
- Project digital Protocol

    Digital protocol table, based on the WBS and Uniclass hierarchy.
- BIM digital data exhibit
    - Digital data protocol
- Model management:
    - Modelling protocols ( authors, Lod, …)
    - Model management protocol
- Program
- Process map